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ON THE

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ASIATIC CHOLERA

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BY

Box 10.

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ON THE ORIGIN AND SPREAD OF THE ASIATIC CHOLERA WHICH REACHED THE UNITED STATES IN 1873.

BY JOHN C. PETERS, M. D., *of New York City.*

The late outbreak of Asiatic cholera in this country, which commenced in New Orleans in February, 1873, was preceded by a great prevalence of the disease in North Germany, Poland, Hungary, and Austria for at least three years, viz: in 1870, 1871, and 1872; and by extended outbreaks in Russia in 1869, 1870, 1871, and 1872; while it had also been present in Persia every year since 1865; and notably so in 1867, 1868, 1869, and 1870.

It is well known to be in operation in India, especially in the province of Bengal, every year; more particularly every third, sixth, ninth, and twelfth years, in connection with the great pilgrimages to Juggernaut, Hurdwar, and their affiliated shrines. The influence of the Juggernaut pilgrimages, or of the worshipers of Shiva, the Destroyer, can be traced from 1781 through the great twelve-year epidemics of 1817, 1829, 1841, 1853, and 1865 in India, stretching north to Calcutta and south to Madras, on the east coast of Hindostan; while the pressure of the adorers of Vishnu, the Preserver, to Hurdwar, in the north of India, and to numberless other sanctuaries, may be seen in the great outbreaks of 1819, 1831, 1843, 1855, and 1869, in India and adjacent places.

The great epidemic of 1865 issued from India, by way of Bombay, to Makallab, and from there up to Mecca by steamships; and was forwarded by Suez, Cairo, and Alexandria to the Mediterranean Sea, and from thence by steamships to Beyroot and back to Damascus in Syria, towards Persia; also to Smyrna, and through Asia Minor again towards Persia. Also, from Alexandria to Constantinople, and from there east through the Black Sea to Trebizond, and down through Armenia, also toward Persia, from the northwest.

It was also forwarded from Bombay, up the Persian Gulf, to Bushire, and from there into Persia, by way of the south. And, finally, returning Persian pilgrims from Mecca carried it back to the Persian Gulf, to Bushire, and Bassorah, from the southwest. (See maps 1, 2, and 3.)

The presence, persistence, and recurring activity of cholera in Persia for so many years, viz, from 1865 to 1872, although paralleled by previous periods of equal continuance, led some observers, especially Dr. Tholozan, principal physician to the Shah, and director of the sanitary administration of Persia since 1843, to conclude that the disease had become naturalized there; and to hint that Persia, rather than India, was the source of the late epidemic in Europe and this country. The entire subsidence of cholera in Persia, however, since 1872, has now finally disproved that supposition; while all the best epidemiologists have again returned to their former conclusions, that the central position of Persia, between India and Europe, exposes it to frequent importation and invasion of cholera, which scarcely allows one outbreak to subside before another is introduced.

We have already seen that these implantings of the pestilence are much more numerous and occur from many more directions than is generally supposed; but we have not yet exhausted the list: for it is frequently conveyed up the Persian Gulf from Kurrachee, at the mouth of the river Indus, as well as from Bombay. From both places it is forwarded to Bushire, the only great Persian port on the gulf, and from there through Shiraz, Yedz, Ispahan, and Kashan, due north to Teheran, the capital of Persia; which is only seventy miles south of Reshdt, the principal port on the south shore of the Caspian Sea; from which it is easily sent up to Russia in Europe. (See map.)

It is also frequently deported from Bombay to Bassorah, at the head of the Persian Gulf; and from there up the rivers Tigris and Euphrates to Hillah, Bagdad, Damascus, Aleppo, and other great cities in Syria and Asia Minor, and then trends toward the Mediterranean and Black Seas.

From Bassorah, near the united mouths of the Tigris and Euphrates, it is frequently carried by pilgrims to the holy shrines of Kerbela (Meshed Hossein) and Nedjef, (Meschid Ali,) just south of Bagdad. From W. A. Shepherd's book (From Bombay to Bushire and Bassorah, p. 10) we learn that Bassorah, at the head of the Persian Gulf, has many pilgrim-boats, which are always crowded with the living and the dead, going up to Kerbela and Nedjef. The living cargoes, consisting of men, women, and children, are huddled together like pigs; from one hundred to one hundred and fifty being crowded together in a space of forty feet by twenty, with twenty-five or more dead bodies piled about; forming rather close packing in the warm season. As these pilgrim-boats passed or went to windward the scent was anything but pleasant; and it was difficult to say whether the living or the dead were most disagreeably fragrant. Then the Arabs living along the shores of the rivers not only stop the vessels and rob the living, but also take and hold the dead bodies in pawn till the price they set upon them is paid by the sorrowing relatives; who believe that their own souls and those of their defunct relatives will never reach paradise, unless they get their bodies to the tombs of Hossein or Ali, at Kerbela or Nedjef. But these pilgrimages of dead and living bodies to Meshed Hossein and Meschid Ali are more than outrivaled by those which proceed to Great Meschid, which is situated in North Persia, due east of Teheran, toward India; and to all three of them, huge congregations of devotees proceed from all parts of Persia, north, south, east, and west. At Kerbela, (Meshed Hossein,) Nedjef, (Meschid Ali,) and Great Meschid, (Meschid Reza,) the gorgeous mosques are hardly less sacred to the various sects of Mohammedans than is the mosque at Mecca. Kerbela, Nedjef, and Great Meschid are (see Lancet, September 18, 1872) probably the most important fostering-places of cholera in North and South Persia; for they are the burial-places of Hossein, Ali, and the Imam Reza, the three most highly rated saints next to Mohammed; to whose shrines not less than one hundred and twenty thousand pilgrims flock annually from Persia and India, bringing with them many hundred corpses in all stages of decomposition, for interment in the sacred soil of these great holy cities.

Again and again the congregation of pilgrim hordes at these places has been the occasion of grave outbreaks of cholera; the disease having been introduced by the incoming Persian and Indian devotees; and carried back by others to the Ottoman dominions. The pestilence, fostered by overcrowding and the unwholesome conditions which always prevail in the so-called sacred cities, attaches itself to other pilgrims going homeward or passing elsewhere; and thus is disseminated widely by them through the districts they traverse.

The pilgrim caravans are difficult to avoid by day; but at night, on the road, one is apt to be awakened from slumber by the shouts of advancing drivers and the tinkling of bells, announcing a passing crowd. By the faint light of the moon or stars one perceives a sea of long black boxes surging by, on scores of mules and camels. Each animal is laden with two of these mysterious objects, one on each side; and many of them are so loosely nailed together that another sense than that of sight soon convinces one that they are coffins. In fact they contain the putrefying bodies of the devout, who, having died in the true Mohammedian faith, are now being taken for burial in holy ground at Meschid, Kerbela, or Nedjef. They are often carried hundreds of miles, and a sickening stench always comes up from their gaping seams; causing nausea and faintness in the drowsy and unsuspecting traveler; who finds it impossible to extricate himself promptly from their disgusting contact, as they come crowding on in the dark, with apparently no limit to their numbers.

While this was going on in Southern and Western Persia in 1865 and 1866, aided by the return of four thousand Persian pilgrims, in boats, from Mecca, by way of the Red and Arabian Seas and Persian Gulf; and double that number by the great Damascus caravan; and a not inconsiderable multitude through Central Arabia, by Medina and Deraia to the west coast of the Persian Gulf; fresh invasions of cholera were coming to Northern Persia from Northwestern Hindostan in 1867, 1868, and 1869. In 1867, after the great Hurdwar epidemic of April 12, 1867, over forty-three thousand deaths occurred from cholera in the Punjab, or Northwestern province of India. Macnamara (see *Treatise on Cholera*, p. 25) says: "The epidemic crossed the western frontier of India toward Persia with a large party of Hurdwar pilgrims on May 19, 1867. It prevailed in Afghanistan with fearful virulence in July, 1867, and continued until September. Passing due west through Herat and Great Meschid, with this early start, it appeared at Teheran, the capital of Persia, just below the Caspian Sea, toward the close of 1867. It was reproduced in Teheran and Meschid, in June and July, 1868; and then extended to Astrabad and Reshd, on the Caspian Sea."

Macnamara then said: "Europe, therefore, is again threatened from Persia, *via* Russia and Turkey."

In 1867, Dr. J. Murray, inspector-general of hospitals, watched cholera arise at the great twelfth-year festival at Hurdwar, at the source of the Ganges, and pass through the northwest corner of India, by way of Lahore, Attock, and Peshawur, with the returning pilgrims to Afghanistan and Persia; and foretold that it would spread over Northern Persia to Russia and Europe. He was no false prophet, for it reached Teheran in 1867 and 1868, and was raging in Persia; while in Russia it was just commencing. (See Map 4.)

This vast irruption of 1867 in Northern India was followed by another in the Punjab in 1869, when over ten thousand deaths occurred among the British white and native troops and residents. (See *Sixth Annual Report of the Sanitary Commissioner with India*, p. 33.)

It prevailed again in Peshawur, the extreme northwestern border town, in August, September, and October, 1869.

Dr. Bryden says, (*ibid.*, p. 220:) "The cholera of 1869 did not stop at the Peshawur frontier. In the first week of September we hear of it above the Kybar Pass, at Jelalabad; and before the middle of September, 1869, its appearance in Kabul, still farther west, was reported."

The *Lancet* of August 31, 1872, says: "To the pilgrimage at Hurdwar, in 1867, and to Great Meschid, in Northern Persia, in 1867 and

1868, may probably be traced the diffusion of cholera in Russia and Europe during the past three years, viz, from 1869 to 1872."

The Times and Gazette of June 29, 1872, says: "India has lately had two great shocks of cholera, viz, in 1867, at Hurdwar; whence it spread northwest into Afghanistan and Persia with the returning pilgrims; and a somewhat similar irruption, in 1869, soon extended as far as the Persian frontier. From Great Meschid, in Northern Persia, where it is known to have prevailed, on both occasions, it was easily distributed over Northwestern Persia to the Caspian Sea; as it is a place of great resort, both by merchants and pilgrims, coming and going from the east and west."

Dr. Renzy, sanitary commissioner of the Punjab, (see Times and Gazette, April 27, 1872,) says: "Epidemics of cholera are becoming more and more frequent in the upper provinces of India; and from thence are easily carried over into Persia. The winds are the same, but travel has much increased. Calcutta and Lahore, only twenty years ago, were five months' journey apart; now only five days. Tens of thousands of Hindoo villagers now travel where few did before; and the facilities of importation of cholera from Bengal are becoming portentous; so that even the natives now complain that the disease is brought to them, far too frequently by troops, travelers, and pilgrims. At Peshawur, since 1858, there have been four terrible outbreaks; those of 1867 and 1869 being awful; the thirty-sixth regiment alone losing 15 per cent. of its men in thirty days."

Thus we have seen that we have ample proof that there were importations and invasions of cholera in Persia in 1865, '66, '67, '68, and '69; and in the Lancet of August 27, 1870, we read: "During the last four years, viz, in 1866, '67, '68, and '69, cholera has prevailed more or less in various parts of Persia, and particularly in those districts bordering on the Caspian Sea, which are in constant communication with Russia, by means of steamships carrying goods and passengers, which run weekly from the port of Astrabad, in the southeast corner of the Caspian Sea, and from Reshd, on the south coast, to Astrakan, at the mouth of the Volga; stopping at various places, especially at Baku on the middle west coast, in a direct line with Tiflis to Poti, on the east coast of the Black Sea."

Although the Persian minister denied that there was any cholera in Persia, he was flatly contradicted by the English resident, who proved that it could have been carried to Russia in 1867, '68, or '69. We also read in the Lancet of October 1, 1870, that the Shah of Persia was about to undertake a pilgrimage either to Meschid or Kerbela, in the hope that the devastations of cholera in his dominions, which had been very great during the last four years, viz, in 1866, '67, '68, and '69, might thereby be diminished. Unfortunately better counsels prevailed, and the Shah was induced to favor some pretended sanitary reforms, instead of perhaps proving in his own person the folly and danger of such pilgrimages."

Early in 1869, (see Lancet, August 14, 1869,) the French government sent Dr. Prout to explore the west shores of the Caspian Sea, from Astrakan to Baku in the west, and from thence to Reshd in the south, and as far as Teheran, the capital, to ascertain if possible the causes and local conditions which have forced cholera always to follow this route in extending from Persia into Russia and Turkey; and to impress upon the Persian government the necessity of carrying out the rules of the sanitary conference with the European powers as agreed upon in 1867, and which had remained almost a dead letter in Persia. Also, to

stop if possible, during the prevalence of the pestilence, the practice of carrying the bodies of those deceased of this or other diseases, with the caravans of living pilgrims.

It had been remarked, (says the *Lancet* of April 29, 1871,) for several years previous to 1870, that the recurring outbreaks in Teheran had almost invariably followed the arrival of pilgrims; and the annual exhumation of bodies for transportation to Meschid and Kerbela.

This quotation furnishes another proof, if any were wanted, that cholera had been in Teheran, which is only seventy miles south of the Caspian Sea, for several years previous to 1870, and we have already seen that it was there in 1865, '66, '67, '68, and '69. The epidemic at Teheran was very virulent. It commenced at the caravanerais near the principal gates of the city, as if coming with pilgrims and travelers; and rapidly extended into the town, in various directions. This outbreak was again attributed to the exhumation of bodies, preceding the annual pilgrimages to Kerbela and Meschid; for not less than three hundred were dug up at Teheran; the greater number of which had died of cholera during the previous autumn and winter. It was again regarded as proven that in Persia the routes of commerce and pilgrimages were also the highways of cholera; and after the disease had prevailed for six years in succession, viz, from 1865 to 1871, a quarantine was at last established below Bagdad, on vessels ascending the Tigris from Bassorah.

Thus it will be seen that Dr. Tholozan was very far from being justified in his positive and enthusiastic assumption that the numerous visitations of cholera in Persia were merely the outbursts of the smoldering embers of their predecessors. There are many flaws of great magnitude in his evidence, which go far to nullify the importance of his conclusions. The first is his ignorance or utter disregard of the numerous importations of the disease from India, Arabia, Syria, Asia Minor, and Turkey; also possibly from Russia.

Drs. Bryden and Cunningham, the statistical officers of India, were guilty of still greater carelessness and positiveness, when they assumed that the cholera of 1869, in Persia, was blown over that country from India to Astrabad, on the Caspian Sea, in the course of a few days; when we have already seen that it marched over the border of India with the Hurdwar pilgrims, as early as April 1867, and reached Meschid and Teheran, to the west, in the fall of 1867; and persisted in 1868. Besides, according to Lieut. Col. Sir Alexander Burnes, (see *Narrative of a Journey to and Residence in Cabul*, p. 77)—

"The most extensive arrangements have long been made to convey pilgrims and merchandise, (and with them cholera,) to and from Northern India and Persia. The Lohanee Afghans are a migratory, commercial, and pastoral people, who proceed annually from the borders of Persia down into Hindostan, in order to purchase merchandise. At the end of October, as winter approaches, they leave Khorassan, in Persia, and descend into India, (where they remain until after the great fair at Hurdwar.) They commence their return toward the end of April; and all reach Cabul and Kandahar by the middle of June; in time to dispatch their investments to Herat and Bokhara; and then pass on into Khorassan, in Persia, where they remain during the summer. They march in three great divisions; the first has twenty-four thousand camels; the second, nineteen thousand; the third, seven thousand." (See map.)

The arrangements for the conveyance of pilgrims, merchandise, travelers, and disease still farther west into Persia are equally complete, according to Sir James Connolly. Due west of Cabul and Herat lies

Meschid, the holy city of Northern Persia. For eight months in the year all the roads, to and from Meschid, are thronged with pilgrims. Nearly sixty thousand come up from India, Cabul, and Afghanistan; and as many more from Turkey in Asia, the Caucasus, and shores of the Black and Caspian Seas.

Cholera has followed this North Persian route very many times, and that of 1869 was at Cabul early in September. Next it was still farther west, at Herat; then, on September 21, 1869, the English political agent at Teheran writes: "It is now some time since the cholera appeared here, and there are from fifty to sixty cases a day."

And still farther west, the agent at Astrabad, in the southeast corner of the Caspian Sea, says: "The cholera made its appearance here on September 8, 1869. It first broke out among the soldiery and irregular cavalry; and these being dispersed, it spread into the town of Astrabad, where it is very virulent."

Here we have a continuous chain of the disease from India, due west, over the old caravan and pilgrim route, through Cabul, Herat, Meschid, and Astrabad, to the shores of the Caspian Sea. But, according to the Lancet of August 27, 1870, it had already been still farther west on the Caspian Sea, viz., at Reshd, the principal port on the south coast, where an outbreak occurred in August, 1869; and a little later it made its appearance at Astrabad, viz., early in September. Again, the Lancet of August 14, 1869, says: "Cholera was reported in the middle of July, 1869, as prevalent at Teheran, only eighty miles south of Reshd, and that there was some danger of it spreading along the shore of the Caspian Sea to Russia and Turkey."

RUSSIA.

Thus cholera had been standing on the borders of Russia for years, when its presence was suddenly announced in one or more places, especially at the holy city of Kiev, on the river Dnieper; more than one hundred miles above Odessa, at its mouth, in July, 1869.

This was regarded as a recrudescence from the great epidemic of 1865 and 1866, without the intervention of any new importation. But in the Times and Gazette of December 2, 1871, we read that Robert Lawson, inspector-general of hospitals, and president of the London Epidemiological Society for 1871, affirms: "There had been a severe outbreak in Persia to the south and east of the Caspian Sea in the autumn of 1868, which continued into 1869; and, in the course of that year it was to be expected in Southern Russia."—*Ib.*, June 25, 1872.

The outbreak in 1869 in Russia corresponded with an exacerbation in Northern Persia, where the disease had been more or less prevalent from 1865 to 1866, as well as in 1867, 1868, and 1869. The Times and Gazette of August 9 says: "The presence of cholera in Persia in 1867 and 1868 converts the probability almost into the certainty that a fresh importation into Russia did occur."

In the British Journal of August 26, 1871, we read: "At Constantinople the opinion is entertained, based upon documents, that the Russian cholera of 1869 and 1870 was due to importation from Persia. The disease is declared to have broken out at Nijni Novgorod, east of Moscow, at the time of the great fair in 1869, and with the arrival of Persian merchants."

According to Dr. Flauvel, one of the most competent French authorities, it was early in 1870 that the alarm was given at Constantinople of an outbreak of cholera at Taganrog, at the head of the sea of Azof, and

at Rostoff, on the river Don ; from whence it spread to the principal cities on the Russian coast of the Black Sea, both east and west ; so that the disease was quickly announced at Kertch and Theodosia in the Crimea ; at Odessa at the mouth of the Dnieper ; and even at Poti on the east coast of the Black Sea. It was assumed that it had been carried from Astrabad and Reshd up to Baku on the west coast of the Caspian Sea ; from there by the new railroad, which had just been completed through Tiflis to Poti ; and from there to Taganrog, as that is the first Russian port which is cleared of ice, in the spring.

As usual, (says Flauvel,) the rapid propagation along the coast of the Black Sea coincided with the arrival by steamships of travelers from infected places. No less than seventy vessels arrived off Constantinople, from infected Russian ports ; but a strict quarantine was established and the pestilence did not break out in Constantinople until 1871. (See map 5.)

The Lancet of August 27, 1870, says : "In August, 1869, an outbreak occurred at Reshd, at the foot of the Caspian Sea, and a little later at Astrabad in the southeast corner ; whence it could easily have been carried up into Russia, by the weekly steamers to Baku and Astrakan ; and from there up the Volga to Nijni Novgorod. In September, 1869, it broke out in Nijni Novgorod, just after the great fair in July and August, to which over two hundred thousand merchants from all parts of Russia, Persia, Central Asia, and other places assemble."

The Lancet (*ibid.*) states : "Later in the year 1869 it appeared at Kiev and Moscow. It also broke out in Taganrog, but did not gain much headway till early in 1870. In 1869, two new lines of railway from Kiev to Odessa, and to Taganrog, came into operation. So that if cholera came out by way of Baku, Tiflis, and Poti, it could be readily and rapidly carried up to Kiev."

From June, 1869, (see Lancet February 19, 1870,) "there had been numerous cases of choleraic diarrhoea in Kiev ; but up to October, 1869, there had been only sixty-nine cases of algid cholera ; and up to December 11, only one hundred and fifteen cases in all. So that the Nijni Novgorod epidemic seems to have been not only earlier, but more severe and extensive."

This moot point will now probably never be cleared up. The Russian authorities claim that the great epidemic of 1865, 1866, and 1867 left Russia with only eighty-three cases of cholera in 1868 ; principally in Kiev ; to which fifty thousand pilgrims come annually ; but also assert that the first case there came from beyond Nijni Novgorod.

In 1869 there were nine hundred and eleven cases reported in Russia ; which are said to have spread from Kiev, as a center, northeast through Orel to Moscow, and from there to Nijni Novgorod ; also down the river Dnieper to Odessa ; and from there to various parts of the Black Sea. In 1870 there were no less than twenty thousand one hundred and forty cases in Russia ; and in 1871, three hundred and five thousand two hundred and twenty cases. (See Practitioner, October, 1873, p. 308. See map 6.)

From Kiev it was said to have been carried by way of Orel to Moscow, and from there to St. Petersburg ; and thence by rail southwest to Riga, Konigsberg, Wilna, and Warsaw.

It was also forwarded from Kiev, by river and canal, to Warsaw ; and along the river Vistula up to Dantzig ; and again to Konigsberg on the Baltic. The arrival of cholera in Konigsberg, and Dantzig, from the north and the south, was for a long time a great puzzle to the authorities ; but was finally cleared up.

From Kiev it was also said to have been carried down the river

Dnieper to Odessa and by steamship to Constantinople, and also from Odessa by the well-known overland route due west through Jassy, Debretzin, and Pesth to Vienna.

From Pesth it was conveyed down by rail to Italy; especially to Trieste, Treviso, and along North Italy to Genoa; from whence it was sent by two steamships down to Rio Janeiro, and Brazil. (See map 7.)

It reached Hamburg in 1872; and was sent from there to London, Havre, Liverpool, New York, and various other places; probably also to New Orleans.

It was carried from Odessa to England; also from Riga and Dantzig; and from Havre. But the English authorities stamped it out promptly, every time.

From the wretched sanitary condition of these places, outbreaks occurred year after year, especially in Kiev, Moscow, and St. Petersburg; and gradually extended to Archangel in the north; Orenburg in the east; Astrakan, Taganrog, and Odessa in the south; and the border provinces of Moldavia, Galicia, Poland, and Pomerania in the west. Wherever outbreaks occurred they were regarded as recrudescences from the unexpired diffusion of 1865 to 1868; although it was also claimed that the pestilence which began at Kief, in 1869, extended from that city, as from a center, and of course must have been carried from it.

At Toula, just below Moscow, the first four cases died at the railway station, about November 13, 1869; yet the disease was pronounced a recrudescence. It did not attain any great extension in Taganrog until June, 1870; yet it was solemnly declared that the outbreak at Taganrog must be looked upon as a recrudescence of the epidemic diffusion of 1865 to 1869; although that city had been in communication with infected places for more than a year. It commenced in Moscow in December, 1869, and did not reach St. Petersburg until August 17, 1870, yet a sanitary commission agreed that it could not have been imported. It is not easy to understand how this body satisfied itself that the disease was not imported, for St. Petersburg had been in direct railway communication with scores of infected places, for many months; and cases had been scattered so freely along the lines of railway leading to and from St. Petersburg, that cholera stations and ambulances were established at the railway junctions, with six beds and one physician to each. The first case in Cronstadt was in the person of an officer from St. Petersburg, which was followed by four others. The disease was scattered down southwest from St. Petersburg, along the line of railroad leading to Warsaw, through Wilna. Officers, soldiers, and conscripts died in various Lithuanian and Baltic towns. It lingered in Wilna, directly east of Konigsberg, on the Baltic, for four weeks; with ten to fifteen deaths daily, before it reached the latter city; and then was brought in by Russian-Polish Jews. Some of the residents of Konigsberg, living in the same hotels and lodging-houses with the Russian merchants, peddlers, vagrants, beggars, and boatmen who introduced the disease, died, while the latter were still only affected with choleraic diarrhoea; but a Russian merchant was among the earliest victims. The Russian physicians, with the simplicity of children, regarded the first death in each place as the initial case of cholera; and made no reference to diarrhoea in relation to cholera. The early cases and groups of cases at Nijni Novgorod, Taganrog, and Kiev were believed to be ordinary cholera nostras, occurring at a time of fairs and pilgrimages; and they were seemingly quite unaware of the chronological relationship of the appearance of cholera in Russia in 1869, with preceding movements of the disease in India and Persia in 1867 and 1868.

For several years, viz., from 1870 to 1873, the great force of the disease seemed to be confined between the forty-first to the sixtieth degree of north latitude, and from the fortieth to the fifteenth degree of east longitude; but especially from the forty-first to the fifty-fifth degree of latitude, and the fifteenth to the thirtieth degree of east longitude. In this square patch, bounded by Odessa, Kiev, and Smolensk, on the east; Odessa, Jassy, Pesth, and Vienna, on the south; Wilna, Konigsberg, Dantzig, Stettin, Lubeck, Altona, and Hamburg, on the north; and Vienna, Prague, Dresden, Berlin, and Stettin, on the west, the pestilence raged in its fullest force. In the west of Russia, rivers that flow north and south, to the Baltic and Black Seas, take their rise under the shadow of the same trees; when in the flood they convert the swamps around their source into one continuous lake; so that a traveler may pass by boat, without interruption, from the Baltic to the Black Sea. One river, the Pripet, a branch of the Dnieper, upon which Kiev is situated, creeps south to the Dnieper through a swamp as long as England. The rivers Niemen, Vistula, and Oder arise in this place and flow north to the Baltic near Tilset, Konigsburg, Dantzig, Elbing, and Stettin; while the Dnieper, the Bog, and Dneister run south to the Black Sea, near Odessa. In Poland, the Niemen and Vistula are connected by canals with the Dnieper; so that there is an uninterrupted water-communication from Odessa and Kiev to Konigsberg and Dantzig. Over forty thousand Polish raftsmen descend the Niemen and Vistula to the Baltic every year, and when the disease was once established in Galicia, which is due west of Kiev, and in Poland, the Baltic provinces were flooded with it every year from 1871 to 1874. And when Hungary was drawn into the vortex, Austria and Italy soon began to suffer.

In Galicia, due west of Kiev, from the first reported case on May 4, 1871, there had been thirty-eight thousand four hundred and forty-eight cases; in three hundred and forty-six different towns and villages.

From October, 1871, to December 13, 1873, there had been four hundred and thirty-three thousand two hundred and ninety-five cases in Hungary, in more than six hundred and two localities.

In Poland, in 1872, there had been thirty-seven thousand five hundred and eighty-six cases.

Various importations and exportations of cholera took place. In September, 1871, the steamer Orion, from Konigsberg, was allowed to go up to the islands at Amsterdam, although the captain had died of cholera. In 1871 an infected vessel from Cronstadt was permitted to come into the Thames. Two infected ships arrived at Hull, England, in 1871. In September, 1871, the schooner Marshall came to Sunderland, England, with her captain dead of cholera. In September, 1871, a fatal case occurred at Hartlepool, England, on board of the Hamburg steamer Uhlenhurst. The United States vessel, Loretto Fish, arrived at Cardiff, Wales, in September, 1871, with four fatal cases, from Hamburg.

The first cases, sixteen in number, in Altona, near Hamburg, occurred August 9, 1871; and the initial attacks happened in Hamburg, August 28, 1871. On September 23, 1871, the ship Alster, from Hamburg, arrived in England, with cases.

In June, 1872, the Austrian steamer Diana carried cholera from Constantinople down to Alexandria. In June, 1872, the steamer Rainbow, of Newcastle, came from Odessa, direct to England, with the disorder. On August 3, 1872, an infected ship from Odessa also arrived at Falmouth, England. In 1872, it forty-seven cases were carried from Warsaw, in Poland, down the Vistula to Dantzig, and spread east and west along the Baltic. In 1872, Cuban vessels were quarantined at Jamaica

against cholera. In Dresden, in 1872, the first case came from Pesth, in Hungary, but was reported as cholera morbus. In August, 1873, it was brought to London, from Hamburg. In June, 1873, several cases were brought to Dresden from Bohemia, (Prague,) on two Elbe steam-boats. It was brought to Liverpool by the ships Rosanne and Hortense, from Havre, which had derived the disease from Hamburg. In August, 1872, there were one hundred and seven cases, in one week, in Hamburg. The schooner Inhama, from Calais, France, arrived at London in 1873. Cholera broke out again in Hamburg, in June, 1873. At Thorn, in East Prussia, on the Vistula, it was brought by Polish raftsmen. At Thorn, the Vistula is connected by a canal with the Oder, and the pestilence was carried down to Stettin. The Oder is also united to the Elbe by another canal, and thus the disorder was brought around from the Baltic, to the North Sea. In 1873, there were twelve hundred and twenty-five cases of cholera in Hamburg. In August, 1873, cases occurred on board the Hamburg steamer Rhine. At Dordrecht, Holland, it was introduced by the bark Freia, from the Baltic, with three deaths on the voyage. In 1872 and 1873, it was carried from Russia to Sweden. In August, 1873, three fatal cases occurred in London, in emigrants who came from Sweden to Kiel, in Denmark, and from there went by rail to Hamburg, and from thence by steamer to London. Cholera prevailed in all three places. In September, 1873, a steamer arrived at London from Cronstadt with cholera. Hamburg had over seven hundred cases from July 26 to August 23, 1873.

In the British Medical Journal, August, 1871, we read: "On board three steamers from Cronstadt, bound for Hull, England, there had been fatal cases of cholera, especially upon the Bingos. These vessels were stopped, and the Privy Council of England ordered all bedding and clothing used by cholera patients on board to be destroyed."

The Lancet of October 11, 1873, says: "The steamer Leibnitz, from Liverpool, has been declared affected with cholera, and put into quarantine at Lisbon. It is well known that two steamers from Genoa, Italy, carried the disease down to Rio Janeiro in 1873; but it is not as well known that there are very large colonies of Italians in Brazil who are apt to import the disorder."

The principal points closely connected with the origin and spread of this last epidemic of cholera from India, in 1867, to Europe and the United States up to 1873 and 1874, which have come out with renewed prominence, are: the fearful amount of contamination of the soil and water; and also, of the air of infected houses and hospitals, arising from the habits, not only of the Hindus and Persians, but of Europeans and Americans.

The Hindus take the lead merely in point of numbers, for they amount to nearly two hundred millions; and the greater heat of their climate. It is estimated that one hundred and fifty millions of them have no privies, and always defecate upon the open ground. Albeit many thousands of tons of human offal have thus been daily deposited upon the surface of the earth, for some thousands of years, yet some little sense of decency is kept up. The women and children of the better classes always have little screens near their houses, behind which they retire, and their accumulations are removed every week by an outcast sweeper-tribe. The males go to the fields, with the ceremony and regularity of prayers, every morning; and all, both men and women, invariably carry with them a little vessel of water, for ablution, which is performed with the left hand only. Then a small quantity of earth is put on the recrement, as in old Mosaic and modern earth-closet times.

But the result has been an enormous defilement of the surface, with a corresponding degree of saturation of the subsoil, and a consequent extensive pollution of the drinking-water everywhere.

In Persia, the huge inclosed caravanserais, in which hundreds of men and animals are shut up every night, have no privies; and their wells are in the center. The flat roofs of the Persian houses, on which the inhabitants sleep in warm nights, are used as places of convenience; and the dried deposits are commonly used for fuel. Thus all their cisterns and rain-water supplies are apt to become contaminated.

In Russia, Germany, and Italy the majority of the cess-pits or privy-vaults are in the cellars of the houses; while the seats are often near the kitchen-fire, for warmth and comfort, while paying tribute to Cloacina.

A remarkable outbreak occurred at Delhi, in connection with this subject of coprology, at a funeral feast given November 26, 1871, by a Righur, in commemoration of the death of his brother. All the male Righurs, a peculiar sect, numbering five hundred in all, were present; and none others. The provisions consisted of cooked rice, wheat, and barley, garnished with sugar and melted butter. The sole drink was water; for meats, liquors, and women are excluded from these solemn repasts. The food was good and carefully cooked; but the huge mass had to be spread upon mats on the floor, and among them was a new mat upon which the dead brother had lain. He had been falsely reported as dead of fever; but it was subsequently discovered that he died, after an illness of a few hours, from severe vomiting and purging. The remains of the feast were carried home to the women and children; so that every man, woman, and child partook of more or less of it. No bad effects were observed for nearly two days, when several began to vomit and purge; and by noon of the third day, there had been forty-five attacks and eleven deaths; and up to the eighth day, seventy seizures and forty-four bereavements. Up to the fifth day, all the cases of cholera were limited entirely to the Righurs; fifteen families of whom lived at some distance. After that it spread to others.

New water-works were opened in Calcutta in 1870, up to which time there had always been from three to six thousand deaths from cholera, per year, in that city. In 1870 the number of deaths fell to fifteen hundred and sixty; in 1871 to seven hundred and ninety, and in 1872 to about six hundred. In December, 1871, an outburst, confined to the inmates of three excellent houses in a fine block of buildings in Russell square, Calcutta, occurred. The three residences formed one boarding establishment, with a kitchen in common. There had been no cholera in that neighborhood for four years. On the night of December 5, all the lodgers were in good health, but in forty-eight hours the large majority of them were sick; among them Archdeacon Pratt, who went to Ghazipoor, three hundred miles off, was seized on the 7th, and died the next day. Only one native servant partook of the food prepared for the Europeans, and he fell a victim. The water and milk were brought by carriers who lived in a suburb called Bhowanipoor; and within a stone's throw of the tank from whence the milkman and water-carrier obtained their water, there had been eight cases of the disease from two to five days before; and it had been prevalent in the neighborhood for a week. The disease was carried in the drinking-water and in the milk diluted with it.

Cholera prevailed in St. Petersburg from 1870 to 1874. Dr. Monall states that the sanitary condition of the city is disgraceful to civilization. The soil is so little above the level of the river Neva that it is saturated with sewage, and the place seems almost floating on a mass of

filth ; for the excrementitious matters from the houses are conducted into porous cess-pits, whence the liquid portions permeate the surrounding earth, and find their way into the open canals which intersect the city, everywhere. High tides or west winds always force back much of the refuse which has reached the river, so that there is no good drainage, or pure pump, or well-water supply. It has long been notorious that the islands, in the river, especially those farthest opposite St. Petersburg, often escape ; but this is because the outscourings of the city are not carried over to them ; and their drinking-water is much better.

Konigsberg, Elbing, Dantzig, Stettin, Lubeck, and other Baltic towns were in an equally unwholesome condition. In Lubeck, according to the official report of Dr. Cordes, more than one-half of the privies are inside of the houses ; and the greater part of the other half, are in the wash-houses. Wooden pails are generally used as receptacles, which are emptied twice a week, in the day-time, by the market-gardeners, who carry off the feculence in open carts, for agricultural purposes. Every three days, the houses, streets, and whole city are pervaded with abominable foulness. Of those who drank of the dirty waters of the Trené and Wakenitz streams, one in six, to one in nine died ; of those who used the not very pure supplies from three rather better sources, from one in thirteen to one in fifteen, and one in thirty-one succumbed ; in almost strict proportion to the purity, or impurity of the fluid.

Professor Forster, of Breslau, (1873,) has just given (see "Spread of Cholera by Means of Wells") a list of towns which have never had large epidemics of cholera, although surrounded by it on all sides, and actually invaded by importations. All these have a pure-water-supply, conveyed in pipes, from distant reliable sources ; and an equally good system of sewerage and drainage. He also gives a register of parts of towns which invariably escape, although other parts of the same city are almost always attacked. The former have good pipe-water ; the latter, foul wells and pumps. The Orphan Asylum in Hallé has always been immune, although the city has often suffered. It is on a hill, and has a separate, unsullied water-supply.

Breslau, with two hundred and eight thousand inhabitants, escaped in 1873, with only fifty-nine cases, in consequence of the recent introduction of chemically pure water, of good taste, and free from all organic and decomposing substances ; by cutting a canal to the river Ohlau, by which all the refuse and filth of the heart of the city were carried off ; and by early and strict attention to the cleanliness of the city, and the most thorough disinfection.

Dresden, Wurzburg, and Lyons are always spared, from the same reason. But in 1867 and 1873, the Julius Hospital in Wurzburg had rather serious outbreaks, connected with bad water and imperfect privy arrangements.

The great Exposition in Vienna in 1873 happened just before the new water-supply was introduced. The tragic death of the celebrated Dr. Henry Bennet's sister, Mrs. Brewster, is full of warning and instruction. She was in the prime of life, in perfect, vigorous health, and had never had a serious illness. She arrived in Vienna on June 10, 1873, and put up at the Hotel Donau, a large, new, and luxurious building, just open to the public. She complained of the drinking-water on the first day ; and put cologne into it, even to wash with. Herself, niece, and maid were all attacked with diarrhoea, as were many of the servants and visitors, who were led to believe that it was a summer bilious complaint, caused by the heat. But the hotel-water became worse and worse. Mrs. B. complained of it to the proprietors, and in her letters home. She then

resorted to milk and mineral water, until she found that the one was diluted, and the other made out of the water on the premises. On the fifteenth day (June 25) the hot water for tea at breakfast smelt so offensively that the hotel-keeper was sent for, who said that one of the drainage-pipes had broken into his well, but that a dozen workmen were rapidly repairing it. Her niece refused to taste the tea, but Mrs. B. had already swallowed some of it. She remained well all day, but was seized with vomiting and purging at 11 p. m., and in six hours was cyanosed and in full collapse, and died in fifteen hours. It was then found that a gentleman had already died of cholera in the hotel, two days before; four more died on the same day with Mrs. B., and nine more soon after; or fourteen deaths among the guests in six days; while many of the servants and others were sent to the hospital, where they also died. The police then interfered, analyzed the water, found it contaminated with sewage, and finally closed the hotel. Whilst the water was merely polluted with ordinary fecal discharges, a harmless, disagreeable, and troublesome diarrhoea prevailed for eleven or thirteen days; but when the two cases of true cholera came to the hotel, and their evacuations got into the well, the Asiatic pestilence broke out with explosive virulence. Cholera had been creeping about in Vienna since April; but its presence, not only there but in Hungary, and all the Austrian dominions, had been carefully concealed, so as not to interfere with the success of the great exposition. If alarm had not been sounded in the English medical journals, and in the London Times, by Dr. Bennet, thousands of valuable lives would have been lost. This country was completely thrown off its guard. Many careful epidemiologists watched the foreign periodicals until the midsummer of 1873, without detecting a trace of any warning of a pestilence which culminated with one hundred and forty thousand deaths in Hungary; forty thousand in Galicia; sixty thousand in Poland; and thirty-seven thousand in Prussia. It was generally believed that there was none in Europe, except perhaps in some very distant and insignificant places.

Hamburg concealed her epidemic so well, that France was misled; and when it broke out in Paris in September, 1873, its course had to be traced back to Havre and Rouen, whence it was imported both by a family from Hamburg, and by a Hamburg vessel which put in at Havre, and had an outbreak soon after its arrival. The celebrated Jules Guérin stoutly denied that genuine cholera had invaded France, for he knew not where it could have come from. Lecadre, Médecin des Épidémies at Havre, admitted the occurrence of numerous sudden deaths from cholera nostras, but denied that they were Asiatic. Finally, two hospital-physicians at Havre proved that Lecadre and Guérin must have very carelessly observed their cases, both in hospital and private practice, or they would sooner have been convinced, that they were genuine Asiatic.

Where concealment is indulged in, proper, rigorous precautions are rarely taken. Hence out of two hundred and ninety-one cases treated in the Paris hospitals from September 16 to November 10, 1873, no less than one hundred and one, or 35 per cent., originated in the hospitals, among the patients suffering with other diseases. One of the Havre cases imported into England is suggestive, but slightly ridiculous. While the steamship *Alliance* was lying at Havre, among the cholera-ships, one of her men fell overboard, head foremost, into the dock-mud. He vomited a quantity of black, filthy water, which he had swallowed, and on September 6, when the *Alliance* arrived at Southampton, he was taken to his own house, and from there to the hospital, where he died of fully-developed cholera. His house was cleansed and disinfected; his bed-

ding and clothes destroyed, and the cab in which he had ridden was purified. A similar case occurred in London. The English authorities gave the greatest publicity to the arrival of every cholera-infected ship, and to the occurrence of every decided case from 1870 to 1874. They concealed nothing; the people were always fully informed, and capable of judging of the amount of danger; and of the efficacy of the means taken to obviate it. Their quarantine was the shortest, and at the same time the sharpest and strictest, that had ever been instituted. Commerce was as little interfered with as possible; while the country was thoroughly protected by the rapid but efficient purification of infected vessels, crews, passengers, clothing, and baggage. The health-authorities of every port in England were held to a strict accountability in all their proceedings; and were always helped and supervised in any emergency, by those great sanitarians, Buchanan, Parkes, Netten-Radcliffe, Burdon Sanderson, and their ever-watchful chief, John Simon. To their intelligence and activity England owes her escape, and they were emulated with no great disparity of comparison at New York.

Some fixed points about the mode and degree of infection have been obtained during this epidemic. Of Maenamara's nineteen persons who drank of cholera-water, only four were attacked; or only about one in five were affected, when the cholera-poison had actually been swallowed down into the stomach. In the Righur outbreak of about five hundred persons who ate of polluted food, there were only seventy attacks, and forty-four deaths; *i.e.*, less than one in ten died, and about one in seven were attacked. In Professor Botkin's forty experiments on dogs, viz., sixteen with spontaneous injections with cholera-urine, sixteen with cholera-stools, eight with cholera-vomits; only twelve, or about 38 per cent., were disordered in any way; and only five died of pure cholera; while four more succumbed from mixed choleraic and putrid poisoning. Hence more than three to one escaped, even from hypodermic injections into the cellular tissue and blood. But it is not a little surprising that seven out of twelve were poisoned by injections of cholera-urine. All going to prove that there are immune persons as well as places.

In four thousand two hundred and three affected houses in the Berlin epidemics of 1866 and 1873, as many as two thousand two hundred and seventy-seven had only one case; proving that cholera has but little inclination to spread, in more than half of all the attacks. There were two cases in eight hundred and ninety-five houses, showing that the tendency to produce two cases is less than twice as small as to induce one case. In four hundred and thirty-five houses there were three cases; four cases, in two hundred and thirty-one houses; five cases, in one hundred and forty-six; six cases, in seventy-two; seven cases, in forty-four; eight cases, in twenty-seven; nine cases, in twenty-eight; ten cases, in seventeen; twelve cases, in six; thirteen, in seven; fourteen, in five, and fifteen cases, each, in five houses; while sixteen, seventeen, eighteen, nineteen, twenty-one, twenty-eight, thirty-two, forty-three, and fifty-four cases, each, occurred in one house. Hence the larger number of houses have a tendency to very small extension of the disease; while a few produce a large number of cases. Hence more than three-fourths of all the affected houses will have only one or two cases. If it were not for this comparative immunity of towns, houses, and persons, the whole world would soon be ravaged by cholera; and it may safely be assumed that any large number of cases occurring in any town or house, points to some great sanitary defect, or carelessness in these places; or to some contamination of food or water, or perhaps milk.

There have been more or less severe outbreaks in the Vienna, Berlin, Wurzburg, Munich, Paris, and Havre hospitals. In strict proportion to the amount of ventilation, cleanliness, purity of the food and water-supply, perfection of the privy and washing arrangements, and to the watchfulness and intelligence of the physicians, nurses, and patients, will be the greater or less extension of the disease. In the Paris Insane Asylum, (Salpetriere,) of five thousand inmates, nearly twelve hundred became victims of the disease. Von Gietl, privy medical counselor and physician to the King of Bavaria, professor and physician-in-chief to the Munich hospital, was sent in 1831 to observe cholera in Berlin, Breslau, Silesia, Bohemia, and Vienna. In the first Berlin cholera hospital, a private dwelling, without hospital conveniences, he saw forty-six out of eighty-one hospital attendants sicken, with the disease, contracted from the patients. In Breslau, four patients, out of eight, in one ward, together with three nurses and one washerwoman. In the first epidemic in Munich, in 1836, of three hundred and twenty-six cases, ninety-four occurred in the wards. In 1854, of seven hundred and thirty-two cases, less than fifty were contracted in the hospital. In 1873 and 1874, of six hundred and seventy-three cases, only forty-eight received the disease in the Munich hospital. Von Gietl is the original suggestor and persistent advocate of the diarrhoeal conveyance of cholera; from observations in Bohemia, in 1831, where he noticed a married beggar-man who was sent back from a cholera-infected town to his native village while suffering with premonitory diarrhea. His wife refused to wash his filthy clothes, which were cleansed by a poor woman in another house, where she hung them up in her room to dry. In two or three days the washerwoman's husband was attacked and died, forming the first fatal case in the village; in two days more, three others died in the same and neighboring houses; and on the third day the washerwoman died, and the husband of the second victim. Then the disease spread. The beggar who introduced it, however, recovered. This succession of cases, corroborated by others, scarcely less clear, led Von Gietl, in the Munich epidemic of 1836, to have a government order issued directing attention to the infection contained in diarrhoea-stools. This Von Gietl theory was enthusiastically adopted by Pettenkofer in 1854, in which year the fecal origin of cholera became very evident in Munich, in connection with the great exhibition there. Pettenkofer almost died from an attack contracted by having his office in the exhibition-building located just above the privies; but soon followed the hypothetical ground-water theory in preference to that which clearly laid under his eyes and nose. Von Gietl has steadily watched for forty-three years the conveyance of the disease by the diarrhoeal-sick, their clothes, utensils, privies, and the food and water contaminated by them. He has traced the disease to publicans, cooks, butchers, pork-, sausage-, and dried-fish merchants; to bakers, milk dealers, washerwomen, foul privies, and polluted water. He places more stress upon indoor privies, than upon subsoil water; more upon emanations from cholera-evacuations than from under-ground waters; more upon surface-filth, than subterranean exhalations; more upon soiled clothes than aerial vapors; more upon vegetables and fruits handled by dirty people, than upon those which are clean, ripe, and well cooked in pure water; more upon mouldy and filthy pork, dried-fish, bacon, sausages and cheese, than upon unstained articles of the same kind. His greatest recent triumph has been in tracing the prolonged epidemic among the Bavarian government horses to pasture manured with the

human offal from the large fever-hospitals, while Pettenkofer was seeking for subsoil water.

Bryden's aerial theory received its heaviest blow when he claimed that the cholera of India was blown to Astrakan and Kief in a few days, in 1869, although it was shown that it had been traveling overland through Persia since 1867; and when he asserted that the Zanzibar outbreak was blown from India to the east coast of Africa, in a few days, while it was proven that it had been traveling down the interior of Africa, from the Red Sea, and absolutely came out from Central Southern Africa to Zanzibar, on the coast, with the slave caravans.

Von Gietl is a staunch advocate of the portability and transmission of cholera by means of diarrhoeal cases; and insists that in large cities the initial cases are rarely the first fatal ones. This is well exemplified in the Lancaster, Ky., outbreak in 1873, in which Mr. Bewley, who introduced the disease, did not die until eighteen others, who had contracted it from him and his surroundings, had preceded him to the grave. Attached to the Munich hospital was a detached building containing twenty-three female patients, some with chronic diseases, and others convalescent from cholera, but still afflicted with diarrhoea. In the course of eight days six fatal cases of cholera occurred, and six severe choleraic attacks among the twenty-three patients. He says, in towns and cities, the initial cases are frequently or generally diarrhoeal, and are then followed by fatal collapse cases; so that the origin of the epidemic is often veiled in obscurity, from all but the closest and most careful observers.

The death of Dr. Obermeir, Virchow's assistant in the Berlin hospital, followed in consequence of his audacious boldness in the endeavor to detect the cause of cholera. He had many specimens of choleraic disease in his room, and finally injected cholera-blood, hypodermically, into his arm, and died in six hours, while endeavoring to examine his own blood microscopically.

Dr. Nedswetzky, of Yaroslav, near Moscow, has apparently discovered the cholera-bacterium, which is developed in enormous quantities in the discharges. He found that quinine, camphor, carbolic acid, tar, calomel, and chloral had no effect upon them; that opium, nux vomica, and chloroform killed them slowly; while tannin, sulphate of iron, chlorine water, (aq. oxymuriat,) and dilute sulphuric, nitric, and muriatic acids killed them rapidly. He suggests the latter six remedies as the most efficient against cholera.



